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EXAMINER	
CHAN, RICHARD	

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2618	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/733,526	KISHI, TAKAHIKO	
	Examiner	Art Unit	
	Richard Chan	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3-8 and 10-27* is/are allowed.

6)☒ Claim(s) *1,2 and 9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 December 2003* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/26/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 18, 20, 22, and 24 are objected to because of the following informalities: Within the claims, anything within parentheses will not be given any patentable weight. Please define the variable "P" such as claim 26, line 29. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: The definition of the variables use in equations on Page 62 lines 15 and 18..

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Camagna (US 6,584,145) and Olgaard (US 6,236,278).

With respect to claim 1, Camanga Fig.4 discloses the numerical control oscillator 104 comprising: a phase accumulator 106 for accumulating input phase difference data to generate phase data, said phase accumulator 106 including a register for storing and outputting said phase data, and a calculator 108 for one of adding and subtracting said input phase difference data and said phase data from said register; (Col.5 lines 15-26) and a memory 114 for storing a phase/amplitude conversion table 116 to output amplitude data corresponding to said phase data generated by said phase accumulator 106, said numerical control oscillator 104 outputting a signal of a sampling frequency Fs, wherein: if an upper limit of a desired frequency setting interval of an output signal is FD and, K and L are arbitrary integers, said calculator 108 of said phase accumulator 106 is performs one of adding and subtracting said input phase difference data and said phase data from said register.

However the Camnga reference does not specifically disclose wherein the a modulo operation taking a nearest integer of M as a modulus, where M=Fs/FD.times.K/L; and said phase/amplitude conversion table outputs a signal set to a frequency setting interval of a dF step, where dF=FD/K.times.L.

The Olgaard reference however discloses in Table 1 Col.9 a phase and amplitude conversion and the modulus results, from a phase accumulator, for a fractional divisor value. (Col.8 lines 56 –Line 67).

It would have been obvious to one of ordinary skill in the art to implement the conversion table implementing a phase accumulator obtaining values of the incoming

signal as disclosed by Olgaard to the numerical control oscillator as disclosed by Camnga in order to obtain phase values of the incoming signal and determining based on the calculated value the appropriate frequency setting for the numerical controlled oscillator.

The Camnga and Olgaard reference are analogous art because both reference are systems that process RF signals and determine appropriate processing.

5. Claims 2 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oesch (7,085,309) in view of Camagna (US 6,584,145) and in further view of Olgaard (US 6,236,278).

With respect to claims 2 and 9, Oesch discloses the digital down-converter comprising a frequency converter 7, the frequency converter including a numerical control oscillator 34 as a local oscillator and serving to frequency-convert an input signal 2 sampled at a sampling frequency Fs, said digital down-converter converting with mixers 20 and 22 and outputting said input signal 2 into an output signal with a frequency lower than that of said input signal,

However Oesch does not specifically disclose a numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a

phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency Fs, wherein, if a desired frequency setting interval of said input signal is FD and K and L are arbitrary integers, said frequency converter is adapted to frequency-convert said input signal using a specific signal output from said local oscillator and set to a frequency setting interval of a dF step, where dF=FD/K.times.L, said local oscillator outputting the specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M as a modulus, where M=Fs/FD.times.K/L.

The Camnga reference however discloses a numerical control oscillator 104 having: a phase accumulator 106 for accumulating input phase difference data to generate phase data, said phase accumulator including a register 114 for storing and outputting said phase data, and a calculator 108 for one of adding and subtracting said input phase difference data and said phase data from said register.

The Olgaard reference discloses a memory (Col.7 line 38) for storing a phase/amplitude conversion table Table 1 Col. 9 to output amplitude data corresponding to said phase data generated by said phase accumulator 670,and a phase and amplitude conversion and the modulus results, from a phase accumulator, for a fractional divisor value. (Col.8 lines 56 –Line 67).

It would have been obvious to one of ordinary skill in the art to implement the conversion table implementing a phase accumulator obtaining values of the incoming signal as disclosed by Olgaard to the numerical control oscillator as disclosed by

Camnga in order to obtain phase values of the incoming signal and determining based on the calculated value the appropriate frequency setting for the numerical controlled oscillator and to implement both teachings to the down converter disclosed by Oesch.

And it would have been obvious to one of ordinary skill in the art to teach the same circuitry except used as an up converter to be used within a transmitter.

The Oesch, Camnga and Olgaard reference are analogous art because both reference are systems that process RF signals and determine appropriate processing.

Allowable Subject Matter

6. Claims 3-8 and 10-27 are allowed.

With respect to claim 3, the prior art discloses the digital down-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency Fs1, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital down-converter converting and outputting said input signal into an output signal with a frequency lower than that of said input signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for

storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said input signal is FD and K1, K2 and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said input signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1/L1;

However the prior art fails to disclose said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs2, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=(FD mod FD1)/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/(FD mod FD1).times.K2.

Claim 4 is dependent on allowable claim 3.

With respect to claim 5, the prior art discloses the digital down-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency Fs1, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital down-converter converting and outputting said input signal into an output signal with a frequency lower than that of said input signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said input signal is FD, and K1, K2 and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said input signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1.times.L1, said first local oscillator

outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1/L1;

However the prior art fails to disclose said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs2, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=(FD1 mod FD)/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/(FD1 mod FD).times.K2.

Claim 6 is dependent on allowable claim 5.

With respect to claim 7, the prior art discloses the digital down-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency Fs1, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital down-converter converting and outputting said input signal into an output signal with a

frequency lower than that of said input signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said input signal is FD and K1, K2 and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said input signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1/L1;

However the prior art fails to disclose said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs2, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference

data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/FD.times.K2.

Claim 9 is dependent on allowable claim 8.

With respect to claim 10, the prior art discloses a digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal,.

However the prior art does not disclose a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency Fs2, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired

frequency setting interval of said output signal is FD, and K1, K2, and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2.times.L2, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/FD.times.K2/L2; and said first frequency converter is adapted to, if a sampling frequency of said input signal is Fs1, frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=(FD mod FD2)/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/(FD mod FD2).times.K1.

Claim 11 is dependent on allowable claim 10.

With respect to claim 12, the prior art discloses a digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal.

However the prior art fails to disclose a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily

frequency-convert an output signal from said first frequency converter, said digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency Fs2, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said output signal is FD and K1, K2 and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2.times.L2, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/FD.times.K2/L2; and said first frequency converter is adapted to, if a sampling frequency of said input signal is Fs1, frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=(FD2 mod FD)/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a

modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/(FD2 mod FD).times.K1.

Claim 13 is dependent on allowable claim 12.

With respect to claim 14, the prior art discloses a digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal, and a second frequency converter.

However the prior art fails to disclose the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency Fs2, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling

frequency, wherein: if a desired frequency setting interval of said output signal is FD and K1, K2 and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2.times.L2, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/FD.times.K2/L2; and said first frequency converter is adapted to, if a sampling frequency of said input signal is Fs1, frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1.

Claim 15 is dependent on allowable claim 14.

With respect to claim 16, the prior art discloses a receiver comprising a first frequency converter, the first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a sampling frequency Fs and a phase locked loop (PLL) circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal.

However the prior art fails to disclose a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said received signal is FD and K1, K2 and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs/FD.times.K1/L1.times.P; and said second frequency converter is adapted to, if a

sampling frequency of the output signal from said first frequency converter is Fs1, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=(FD mod FDP)/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs1/(FD mod FDP).times.K2.

Claim 17 is dependent on allowable claim 16.

With respect to claim 18, the prior art discloses a receiver comprising a first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal.

However the prior art does not disclose a second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a

frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said received signal is FD, and K1, K2, and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs/FD.times.K1/L1.times.P; and said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs1, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=(FDP mod FD)/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs1/(FDP

mod FD).times.K2.

Claim 19 is dependent on allowable claim 18.

With respect to claim 20, the prior art discloses a receiver comprising a first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal.

However the prior art fails to disclos a second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing

a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said received signal is FD, and K1, K2, and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs/FD.times.K1/L1.times.P; and said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs1, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs1/FD.times.K2.

Claim 21 is dependent on allowable claim 20.

With respect to claim 22, the prior art discloses a transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit

data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert the output signal from said modulator.

However the prior art fails to disclose a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said transmit signal is FD, and K1, K2, and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K2.times.L2, said second local oscillator

outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs/FD.times.K2/L2.times.P; and said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is Fs1, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=(FD mod FDP)/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/(FD mod FDP).times.K1.

Claim 23 is dependent on allowable claim 22.

With respect to claim 24, the prior art discloses a transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert the output signal from said modulator.

However the prior art fails to disclose a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a

reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said transmit signal is FD, and K1, K2, and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K2.times.L2, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs/FD.times.K2/L2.times.P; and said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is Fs1, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=(FDP mod FD)/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer

of M1 as a modulus, where M1=Fs1/(FDP mod FD).times.K1.

Claim 25 is dependent on allowable claim 24.

With respect to claim 26, the prior art discloses a transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert the output signal from said modulator.

However the prior art does not discloses wherein a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P, where P is an integer, and acting to receive the output signal from the numerical control oscillator of claim 1 as a reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, wherein: if a desired frequency setting interval of said transmit signal is FD, and K1, K2, and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K2.times.L2, said second local oscillator outputting the first specific signal by

accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs/FD.times.K2/L2.times.P; and said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is Fs1, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1.

Claim 27 is dependent on allowable claim 26.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The Reichert reference (US 7,064,616) discloses a multi-stage numeric counter oscillator.

The Alverez reference (US 5,619,535) discloses a digital frequency synthesizer.

The Renard reference (US 5,822,376) discloses a high speed multiplier to multiply a digital signal by a periodic signal.

The Schland reference (US 5,890,051) discloses a On-Channle transceiver acrchitecture in a dual band mobile phone.

The Ke reference (US 6,696,886) discloses an automatically adjusting gain/bandwidth loop filter.

The Counselman reference (US 4,860,018) discloses a continous wave interference position from signals from satellites.

The Counselman reference (US 4,870,422) discloses a method and system for determining position from signals from satellites.

The Shohara reference (US 6,463,266) discloses a radio frequency control for communications systems.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard Chan whose telephone number is (571) 272-0570. The examiner can normally be reached on Mon - Fri (9AM - 5PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edan Orgad can be reached on (571)272-7884. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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